Articular cartilage regeneration by activated skeletal stem cells.

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Public Summary:

Scientific Abstract:
Osteoarthritis (OA) is a degenerative disease resulting in irreversible, progressive destruction of articular cartilage(1). The etiology of OA is complex and involves a variety of factors, including genetic predisposition, acute injury and chronic inflammation(2-4). Here we investigate the ability of resident skeletal stem-cell (SSC) populations to regenerate cartilage in relation to age, a possible contributor to the development of osteoarthritis(5-7). We demonstrate that aging is associated with progressive loss of SSCs and diminished chondrogenesis in the joints of both mice and humans. However, a local expansion of SSCs could still be triggered in the chondral surface of adult limb joints in mice by stimulating a regenerative response using microfracture (MF) surgery. Although MF-activated SSCs tended to form fibrous tissues, localized co-delivery of BMP2 and soluble VEGFR1 (sVEGFR1), a VEGF receptor antagonist, in a hydrogel skewed differentiation of MF-activated SSCs toward articular cartilage. These data indicate that following MF, a resident stem-cell population can be induced to generate cartilage for treatment of localized chondral disease in OA.